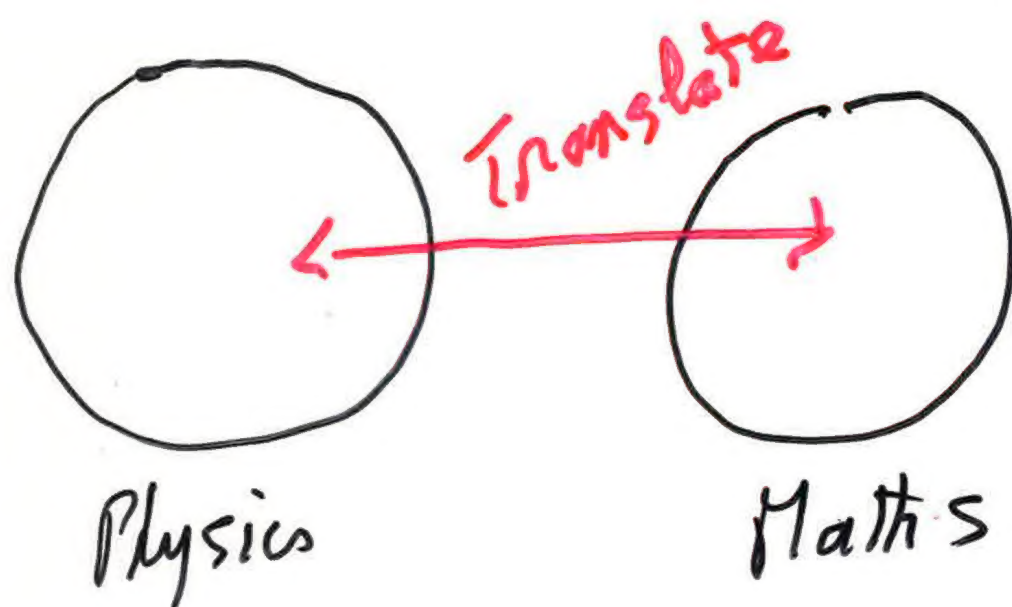
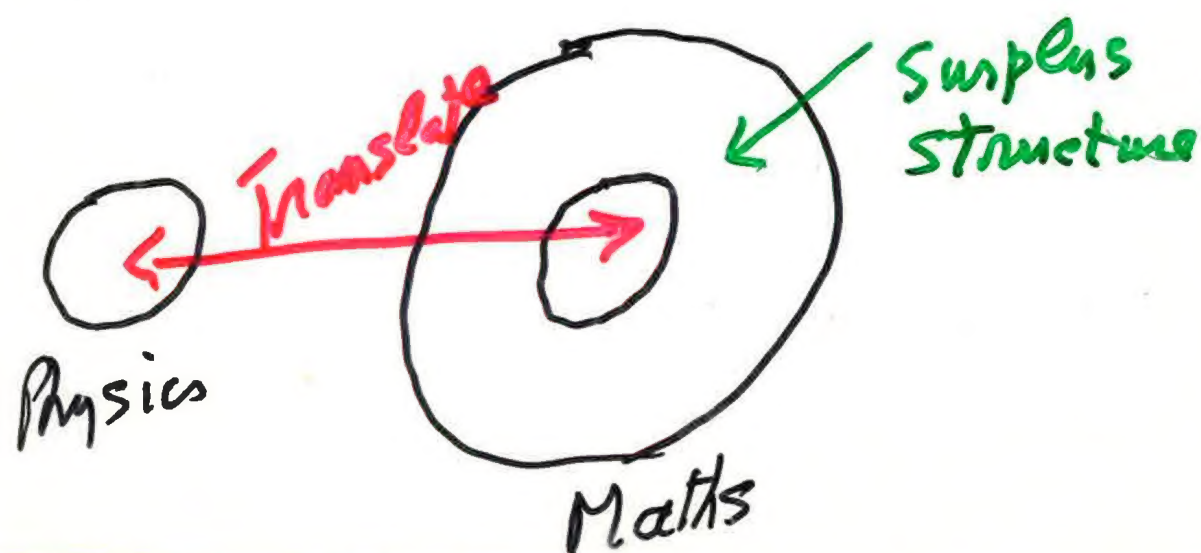


THE RÔLE OF MATHEMATICS IN PHYSICS

(9)



SURPLUS STRUCTURE



Ghosts in Particle Physics —

Steven Weinberg, Quantum Theory of Fields
Vol 2, 1996

15.6 Ghosts

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Section 9.5, the determinant of any matrix $\mathcal{F}_{\alpha x, \beta y}$ may be expressed as a path integral

$$\text{Det } \mathcal{F} \propto \int \left[\prod_{\alpha, x} d\omega_{\alpha}^*(x) \right] \left[\prod_{\alpha, x} d\omega_{\alpha}(x) \right] \exp(iI_{GH}), \quad (15.6.1)$$

where

$$I_{GH} \equiv \int d^4x d^4y \omega_{\alpha}^*(x) \omega_{\beta}(y) \mathcal{F}_{\alpha x, \beta y}. \quad (15.6.2)$$

Here ω_{α}^* and ω_{α} are a set of independent anticommuting classical variables, and the constant of proportionality is field-independent. (We have to

TIBETAN GHOST TRAP

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